CLAIMS

What is claimed is:

1. A portable induction heating system, comprising:

a power source;

a fluid cooling unit operable to provide a flow of cooling fluid;

an induction heating device that is electrically coupleable to the power source and fluidicly coupleable to the fluid cooling unit;

a system controller operable to control operation of the power source; and

a flow switch that is electrically coupled to the system controller and operable to sense the flow of cooling fluid,

wherein the system controller controls operation of one of the power source and the fluid cooling unit to prevent heat damage to the induction heating device when the flow of cooling fluid through the flow switch is below a desired flow rate.

2. The system as recited in claim 1, wherein the system controller controls operation of the power source to prevent power from being applied to the induction heating device when the flow of cooling fluid through the flow switch is below the desired flow rate.

3. The system as recited in claim 1, wherein the system controller controls operation of the fluid cooling unit to increase fluid flow when the flow of cooling fluid through the flow switch is below the desired flow rate.

4. The system as recited in claim 1, wherein the flow switch is located downstream of the induction heating device.

5. The system as recited in claim 1, wherein the controller comprises an indicator to provide an indication when the flow of cooling fluid through the flow switch is below the desired flow rate.

6. The system as recited in claim 5, wherein the indicator is a visual indicator.

7. The system as recited in claim 5, wherein the indicator is an audible indicator.

8. The system as recited in claim 5, comprising a communication circuit operable to contact a user electronically when the flow of cooling fluid through the flow switch decreases below the desired flow rate.

9. A controller for a fluid-cooled portable induction heating system, comprising:

a power source controller operable to control a power source of the portable induction heating system; and

a flow sensor electrically coupled to the system controller and operable to sense cooling fluid flow rate, wherein the power source controller prevents the power source from

applying power to an induction heating device coupled to the power source when the fluid flow rate is below a specified fluid flow rate.

10. The controller as recited in claim 9, comprising:

an enclosure to house the power source controller and flow sensor; and

input and output fluid connectors disposed on the enclosure and fluidicly coupled to the flow sensor.

11. The controller as recited in claim 9, comprising a light indicative of cooling fluid flow rate.

12. The controller as recited in claim 9, comprising an audible alarm, wherein the audible alarm sounds when the fluid flow rate drops below the specified fluid flow rate.

13. The controller as recited in claim 9, comprising a communication device operable to communicate electronically to a user when the fluid flow rate drops below the specified fluid flow rate.

14. The controller as recited in claim 9, wherein the flow sensor is a flow switch that is in a first electrical state when the fluid flow rate through the flow switch is below the specified fluid flow rate and is in a second electrical state when the fluid flow rate through the flow switch is above the specified fluid flow rate.

15. A controller for a portable induction heating system, comprising:

a power source controller operable to control a power source of the portable induction heating system; and

an indicator to provide an indication when an improper operating condition exists in the power source.

16. The controller as recited in claim 15, wherein the indicator is a visual indicator.

17. The controller as recited in claim 15, wherein the indicator is an audible indicator.

18. The controller as recited in claim 15, wherein the indicator is a paging system operable to inform a user of the specific improper operating condition.

19. The system as recited in claim 15, comprising a flow sensor operable to sense cooling fluid flow rate, wherein the indicator provides the indication when cooling fluid flow rate is below a minimum fluid flow rate.

20. The system as recited in claim 15, wherein the flow sensor is electrically coupled to the system controller and the system controller operates the power source to remove power from an induction heating device coupled to the power source when cooling fluid flow rate is below the minimum fluid flow rate.

21. The system as recited in claim 15, wherein the improper operating condition is a power source operating parameter reaching a limiting condition.

22. A method of operating a portable fluid-cooled induction heating system having a portable fluid cooling unit with a supply side and a return side, comprising:

routing cooling fluid from a portable fluid-cooling unit to a fluid-cooled induction heating apparatus;

routing the cooling fluid from the fluid-cooled induction heating apparatus to a flow sensor operable to sense cooling fluid flow ;

providing a desired cooling fluid flow to the fluid-cooled induction heating apparatus; and

automatically removing power from the fluid-cooled induction heating apparatus when the flow sensor indicates that cooling fluid flow is less than the desired cooling fluid flow.

23. The method as recited in claim 22, comprising prohibiting power from being applied to the fluid-cooled induction heating apparatus when the flow sensor indicates that cooling fluid flow is less than the desired cooling fluid flow.

24. The method as recited in claim 22, comprising providing a visual indication on a controller operable to control power to the fluid-cooled induction heating apparatus

when the flow sensor indicates that cooling fluid flow is less than the desired cooling fluid flow.

25. The method as recited in claim 22, comprising providing an audible alarm when the flow sensor indicates that cooling fluid flow has dropped below the desired cooling fluid flow.

26. The method as recited in claim 22, comprising providing an electronic signal to a communication device when the flow sensor indicates that cooling fluid flow has dropped below the desired cooling fluid flow.

27. A method of assembling a portable induction heating systemat a worksite, comprising:

fluidicly coupling a first end of a fluid-cooled induction heating device to a supply side of a fluid cooling unit;

fluidicly coupling a second end of the fluid-cooled induction heating device to a flow sensor operable to sense fluid flow therethrough, the flow sensor being electrically coupled to a power source controller operable to control power from the induction heating device; and

fluidicly coupling the flow sensor to the return side of the portable fluid cooling unit.

28. The method as recited in claim 27, comprising wherein the flow sensor is disposed within an enclosure housing the power source controller.

29. A portable induction heating system, comprising:

a power source;

a fluid cooling unit operable to provide a flow of cooling fluid;

an induction heating device that is electrically coupleable to the power source and fluidicly coupleable to the fluid cooling unit;

a system controller operable to control operation of the power source; and

a flow switch that is electrically coupled to the system controller and operable to sense the flow of cooling fluid,

wherein the system controller controls the operation of the power source to prevent power from being applied to the induction heating device when the flow of cooling fluid through the flow switch is below a desired flow rate.

30. The system as recited in claim 29, wherein the system controller removes power from the induction heating device when the flow of cooling fluid through the flow switch drops below the desired flow rate

31. The system as recited in claim 29, comprising an indicator to provide an indication when the flow of cooling fluid through the flow switch is below the desired flow rate.

32. The system as recited in claim 31, wherein the indicator is disposed on the exterior of the system controller.

33. The system as recited in claim 31, wherein the indicator is a visual indicator.

34. The system as recited in claim 31, wherein the indicator is an audible alarm.

35. The system as recited in claim 31, comprising a communication circuit operable to contact a user electronically when the flow of cooling fluid through the flow switch decreases below the desired flow rate.

36. A controller for a portable fluid-cooled induction heating system, comprising:

a power source controller operable to control a power source and a fluid cooling unit of the portable induction heating system; and

a flow sensor electrically coupled to the system controller and operable to sense cooling fluid flow rate, wherein the power source controller restores the fluid cooled induction heating system to a safe condition when the fluid flow rate drops below a specified fluid flow rate.

37. The controller as recited in claim 36, wherein the system controller controls operation of the power source to prevent power from being applied to the induction heating device when the flow of cooling fluid through the flow switch is below the desired flow rate.

38. The controller as recited in claim 36, wherein the system controller controls operation of the fluid cooling unit to increase fluid flow when the flow of cooling fluid through the flow switch is below the desired flow rate.

39. The controller as recited in claim 36, comprising a light, wherein the light is illuminated when the fluid flow rate is below the specified fluid flow rate.

40. The controller as recited in claim 11, wherein the light is illuminated when the fluid flow rate is below the specified fluid flow rate.

41. The controller as recited in claim 11, wherein the light is illuminated when the fluid flow rate is equal to or greater than the specified fluid flow rate.

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~~41.~~ The controller as recited in claim 9, wherein the flow sensor provides a variable output corresponding to fluid flow through the flow sensor.

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~~42.~~ The system as recited in claim 1, wherein the flow switch is external to the controller.